

CE

(C) an organic solvent.

CM 36. (Amended) The gravure compatible laminating printing ink of claim 29 comprising: about 8 to about 60 wt. % solvent-soluble poly(urethane/urea) resin; about 3 to about 30 wt. % colorant; and about 15 to about 60 wt. % organic solvent.

Remarks

Applicants' and their attorney, Sidney Persley, submit that the remarks and amendments made herein are pursuant to an interview with the Examiner on May 27, 2003. Applicants attorney would like to thank the Examiner for the kindness, courtesy and consideration shown during the interview. Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE". No new matter is added to the specification by way of such amendments.

(2-3) Rejection Under 35 U.S.C. § 112, Second Paragraph

Claims 1-49 have been rejected under 35 U.S.C. §112, second paragraph, as being indefinite. More specifically, the Examiner states that Claims 1, 36, 24, 27 and 28 are confusing. As a result of the aforementioned interview, the Examiner has withdrawn the rejection under 35 U.S.C. § 112, Second Paragraph as it applied to Claim 27.

Claims 1 and 29 are believed to be unclear as to the rate of prepolymer addition. Claims 1 and 29 have been amended, as suggested by the Examiner, and now state that the controlled rate of prepolymer addition to diamine is between 3.33 and 10 weight percent of polyurethane prepolymer per minute.

The Examiner states that Claim 36 is confusing since it does not state the basis for the component percentages claimed. The percentages are weight percentages and the claim has been amended accordingly. Basis for the amendment is found on page 17, lines 23 to 24, of Applicants' specification.

Finally, the Examiner states that Claims 24 and 28 fail to define the values for the formula variables "n" and "m". The claims have been amended to correct what Applicants consider to be a typographical error in providing the formula variables. Variable "n" is now defined as having a value of 1 or 2 and variable "m" is now defined as having a value of 4.

Based on the foregoing amendments and comments, Applicants ask that the rejections under 35 U.S.C. §112, Second Paragraph, be withdrawn.

**(6) Rejection Under 35 U.S.C. § 102(b) and
35 U.S.C. § 103(a)**

Claims 1, 2, 3, 5, 6, 8, 9, 11, 13, 15, 16, 18, 19, 20, 21, 24, 24, 27 and 28 have been rejected under 35 U.S.C., §102(b) as being anticipated by the Fuji Spinning reference, JP 58,194,915 (hereinafter "JP '915") and under 35 U.S.C. §103 as obvious over JP '915. As a courtesy to the Examiner, Applicants attach a copy of an English language translation of JP '915.

In JP '915, the urethane/urea composition is prepared by a process wherein diamines are mixed with diisocyanates. The process conditions employed in JP '915 are different from those employed by Applicants and would undoubtedly result in a different resin having different physical and/or performance properties from Applicants' resin. In JP '915, it is clear that a polyurethane polymer is formed and dissolved in an inert polar solvent forming a solution. Diamine is then added to this solution to chain extend the polymer (see Claim of JP' 915).

In contrast, Applicants' poly(urethane/urea)resin is prepared by **adding the polyurethane prepolymer to the diamine**. Furthermore, Applicants also

require that the polyurethane prepolymer addition to the diamine occur at a **controlled rate of between about 3.3 to about 10 weight percent of polyurethane prepolymer per minute.**

Applicants point out that the specific **order** of polyurethane prepolymer addition and **rate** of polyurethane prepolymer addition in Applicants' process is critical to avoid or eliminate gelling of the poly(urethane/urea) resin. Applicants' order of polyurethane prepolymer addition is exactly **opposite** (emphasis added) the order specified in JP '915. It is also important to note that Applicants' controlled rate of polyurethane prepolymer addition to the diamine is specifically calculated to be a function of Applicants' order of addition and is unique to the Applicants' ability to avoid gelling the poly urethane/urea resin. The surprising benefit of Applicants' invention is that by controlling the rate of the polyurethane prepolymer addition to diamine, where more than 100% diamine is used in the reaction, the formation of an extremely viscous and/or unworkable poly(urethane/urea) resin is eliminated or substantially avoided (see, page 11, lines 7 and 8 of Applicants' specification). Accordingly, JP '915 does not disclose, teach or suggest Applicants' specific **order** of addition, and in fact, teaches the opposite. Nor does JP '915 disclose, teach or suggest adding the polyurethane prepolymer at a **controlled rate**. It is therefore submitted that the urethane/urea resin formed in JP '915 is different from Applicants' resin as it could become extremely viscous or unworkable, especially when more than 100% diamine is used.

For the foregoing reasons, Applicants kindly ask that the rejections be withdrawn.

(7) **Rejection Under 35 U.S.C. § 102(b) and**
 35 U.S.C. § 103(a)

Claims 1-3, 8, 9, 1, 13, 14, 15, 6, 20, 21, 24, 25, 27 and 29 have been rejected under 35 U.S.C. §102(b) as being anticipated by Ward (WO 93/22360) and under §103(a) as being obvious over Ward.

In Ward the polyurethane/urea is made in solvent by adding the -NCO prepolymer to the diamine **but only to about 100%**, which would **make it unlikely that gelling would occur**. Since no gellation is likely to occur, Ward does not address controlled additions to avoid gelling. Ward does not disclose, teach or suggest that the addition of polyurethane prepolymer be carried out at a **controlled rate of between about 3.3 to about 10 weight percent of polyurethane prepolymer per minute**. As previously stated, Applicants have discovered that by controlling the rate of polyurethane prepolymer addition to diamine, **where more than 100% diamine is used** in the reaction, **the formation of an extremely viscous and/or unworkable poly(urethane/urea) resin is eliminated or substantially avoided**. It is therefore submitted that the polyurethane/urea formed in Ward is different from Applicants' resin. Therefore, Applicants kindly ask that the rejections be withdrawn.

(8) Rejection Under 35 U.S.C. §103(a)

Claims 1-5 and 7-48 are rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent 4,590,254 (hereinafter "Chang") in view of U.S. Patent No. 6,245,695 (hereinafter "Maruo et al.>").

Although Chang employs a polyurethane/urea, there is no mention of adding a polyurethane prepolymer to diamine at a **controlled rate of between about 3.33. to about 10 weight percent of polyurethane prepolymer per minute**. To cure this deficiency in Chang, the Examiner cites Maruo et al. for the proposition that it teaches a polyurethane prepolymer added to a diamine to produce a polyurethane resin. While Maruo et al. teach adding a diisocyanate and polyester polyol, there is no disclosure, suggestion, or teaching of adding the polyurethane prepolymer to the diamine at a **controlled rate of between about 3.33. to about 10 weight percent per minute**. Instead, Maruo et al. can control and or avoid gelling of the polymer by adding a **polymerization inhibitor** to the reaction mixture (see, Col. 7, lines 29-30; and Col. 7, lines 60-62.) Thus, Maruo et al. have no need to concern themselves with a specific rate of addition to

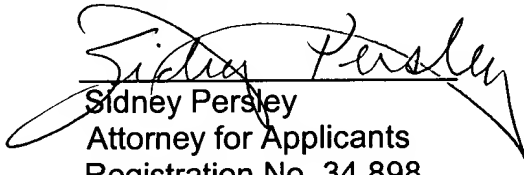
avoid gelling since the regulation or prevention of gelling is controlled by merely adding polymerization inhibitor. Additionally, Maruo only uses **a single polyol, as opposed to Applicants' use of two diols or polyols**. One skilled in the art would not look to Maruo for guidance on avoiding gelling when using a **combination of polyols** since Maruo **uses a single polyol**.

In contrast, Applicants polyurethane/urea resin formulation does not include an inhibitor to control gelling. Applicants avoid gelling by adding the polyurethane prepolymer to the **diamine at a controlled rate of between 3.33 to about 10 weight percent of polyurethane prepolymer**. Chang and Mauro et al. either individually or in combination do not teach or suggest controlling gelling of polyurethane urea resins. Therefore, Applicants kindly ask that the rejection be withdrawn.

Applicants believe that the amendments and remarks provided herein adequately and completely address all of the rejections raised by the Examiner and place the claims in condition-for-allowance.

July 11, 2003

Respectfully submitted,

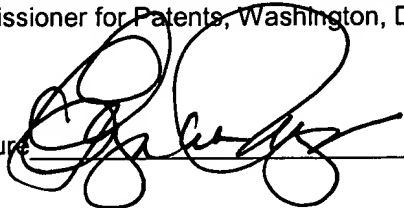

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Certificate of Mailing

I, Elizabeth Reyes, hereby certify that this correspondence (and any referred to as being attached or enclosed) is being deposited with the United States Postal Service with sufficient postage as first class mail on the date below and in an envelope addressed to: Assistant Commissioner for Patents, Washington, D.C. 20231.

Signature

A handwritten signature in black ink, appearing to be 'Elizabeth Reyes', written over a horizontal line.

Date

7/14/03

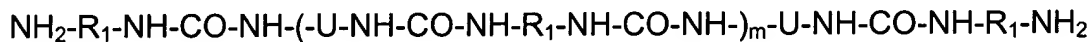
APPENDIX I

VERSION WITH MARKINGS TO SHOW CHANGES MADE

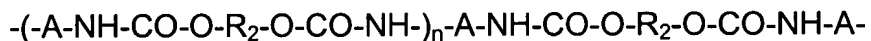
In the Specification

Please amend the paragraph at Page 6, line 21 to page 7 line 8 to read:

The solvent-soluble poly(urethane/urea) resin of the present invention is derived from a condensation of poly(urethane) prepolymer containing 1.3 to 6.0 wt % of unreacted isocyanate (i.e., -NCO) groups and 80% to 120% of a diamine based on the equivalents of the unreacted -NCO groups. The resulting poly(urethane/urea) resin has the structure:



Wherein R₁ is a covalent bond or a C1-10 alkyl group, m has the value of 4 and -U- has the structure:

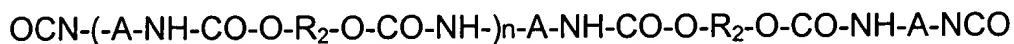


wherein -A- is an aryl or alkyl group; [and] R₂ comprises R₃ and R₄, wherein R₃ is an alkyl or a polymeric group having a molecular weight below 2000, and wherein R₄ is a polymeric group having a molecular weight below 3000, and n has the value of 1 or 2. Typically, the molecular weight of R₃ is less than the molecular weight of R₄, and the molar ratio of R₄ to R₃ ranges between about 90:10 and about 10:90. A preferred ratio of R₄ to R₃ is about 55:45. Preferably, the resin has a molecular weight between about 10,000 and about 80,000.

On page 7, please replace the paragraph ending at line 30 with the following:

The polyurethane prepolymer is a condensation reaction product of a diisocyanate component and a diol component in which the -NCO/-OH ratio is

less than 2. As used herein the “-NCO/-OH ratio” is intended to mean the ratio of equivalents of -NCO groups in the diisocyanate component, to equivalents of -OH in the diol component. The -NCO/-OH ratio is sometimes identified as the isocyanate index (I.I.). Preferably, the -NCO/-OH ratio is between about 1 and 2, and more preferably 1.5. The polyurethane prepolymer has the structure:



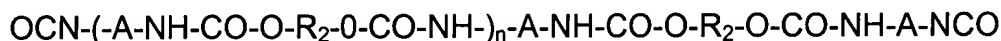
wherein -A- is an aryl or alkyl group; [and] R₂ is R₃ and R₄; wherein R₃ is an alkyl or a polymeric group having a molecular weight below 2000; wherein R₄ is a polymeric group having a molecular weight below 3000, and n has the value of 1 or 2. As indicated above, the polyurethane prepolymer contains 1.3 to 6 % by weight of unreacted -NCO groups which are represented in this polyurethane structure. In particular, the nitrogen content of the solvent-soluble poly(urethane/urea) resin of the present invention is from 1.3 to 6.0 % by weight. Typically, the molecular weight of R₃ is less than the molecular weight of R₄, and the molar ratio of R₄ to R₃ ranges between about 90:10 to about 10:90; and preferably, R₂ contains from about 30 to about 80 equivalent % of R₄, and the ratio of R₄ to R₃ is about 55:45.

In the Claims

1. (Thrice Amended) A solvent soluble poly(urethane/urea) resin derived from a polyurethane prepolymer being the reaction product of:
 - (b) a diisocyanate component and a diol component having:
 - (i) a first diol having a molecular weight below 2000 and
 - (ii) a polymeric diol having a molecular weight below 3000; wherein the -NCO/-OH ratio is less than 2 and containing 1.3 to 6.0 % by weight of unreacted -NCO groups and

(b) diamine; wherein the amount of diamine is 100% to 120% based on the equivalents of unreacted –NCO groups and the polyurethane prepolymer is added to the diamine at a controlled rate of between about 3.33 [1.5 weight percent per minute] to about 10 [5.0] weight percent of polyurethane prepolymer per minute.

24. (Amended) The resin of claim 1 wherein the polyurethane prepolymer has the structure:

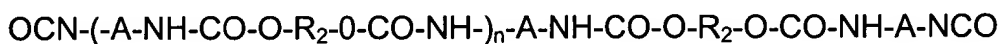


wherein –A- is an aryl or alkyl group; and R₂ comprises R₃ and R₄; wherein R₃ is an alkyl or a polymeric group having a molecular weight below 2000; wherein R₄ is a polymeric group having a molecular weight below 3000; wherein n is 1 or 2.

28. (Amended) The resin of claim 1 wherein the poly(urea/urea) resin has the structure:



wherein R₁ is a covalent bond or a C₁₋₁₀ alkyl group; –U- has the structure; and m is 4:



wherein –A- is an aryl or alkyl group; and R₂ comprises R₃ and R₄; wherein R₃ is an alkyl or a polymeric group having a molecular weight below 2000; wherein R₄ is a polymeric group having a molecular weight below 3000; wherein n is 1 or 2.

29. (Thrice Amended) A solvent-based flexographic and gravure compatible laminating printing ink comprising:

(A) a solvent-soluble poly(urethane/urea) resin derived from a polyurethane prepolymer being the reaction product of:

- (b) a diisocyanate component and a diol component having:
 - (i) a first diol having a molecular weight below 2000 and
 - (ii) a polymeric diol having a molecular weight below 3000; wherein the –NCO/-OH ratio is less than 2 and containing 1.3 to 6.0 % by weight of unreacted –NCO groups and
- (b) diamine; wherein the amount of diamine is 100% to 120% based on the equivalents of unreacted –NCO groups and the polyurethane prepolymer is added to the diamine at a controlled rate of between about 3.33 [1.5 weight percent per minute] to about 10 [5.0] weight percent of polyurethane prepolymer per minute;
- (B) a colorant; and
- (C) an organic solvent.

36. (Amended) The gravure compatible laminating printing ink of claim 29 comprising: about 8 to about 60 wt. % solvent-soluble poly(urethane/urea) resin; about 3 to about 30 wt. % colorant; and about 15 to about 60 wt. % organic solvent.